VEX PILOT PROGRAM

RINGS-N-THINGS

Game Manual

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Table of Contents

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The VEX Pilot Program

Innovation and ingenuity are the hallmarks that turn nations into world leaders, and it is up to all of us to develop ways to show today's younger students how they can be the next generation of STEM (Science Technology Engineering and Math) leaders who know how to work together to solve complex problems. Allowing for exploration and open-ended challenges provide children with firsthand experience of what engineers do and shows how what they are learning in the classroom applies in the real world.

We know that working with robots in a competition format is a very powerful tool that provides the excitement needed to hold the attention of young students, allowing them to become skilled at math and science concepts through hands on, student centered learning. The life skills of teamwork, collaboration and the development of the critical thinking and communication skills will serve all of us well in the development of a successful future workforce.

We see that students who previously had not considered STEM fields are now open to these subjects and developing into lifelong learners who are passionate about learning and applying their knowledge.

The VEX Pilot Program, presented by the Robotics Education & Competition Foundation, is a program that promotes to pursuit of STEM-related education and career paths for all students.

For additional information visit www.vexrobotics.com and www.roboticseducation.org

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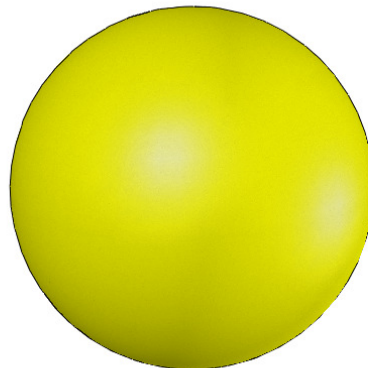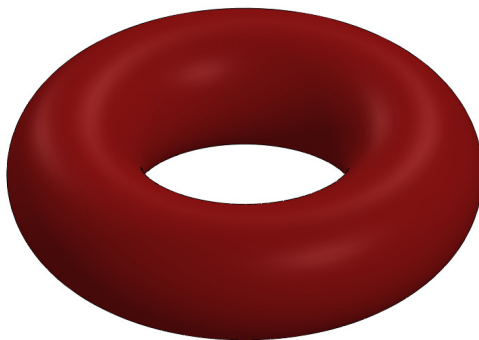
VEX Rings-n-Things – A Primer

VEX Rings-n-Things is played on a 4 ft x 8 ft field, surrounded by a 3 ½ inch tall perimeter. There are four goals and eight rings into which teams can score thirty-six balls. The field is divided by the ramp.

While participating in the VEX Pilot Program - Rings-n-Things, teams will develop many new skills in response to the challenges and obstacles that stand before them. Some problems will be solved by individuals, while others will be handled through interaction with their student teammates and adult mentors. Teams will work together to build a VEX robot to compete in the World Championship of VEX Robotics. Students come away not only with the accomplishment of building their own competition robot, but also with an appreciation of science and technology and how they might use it to positively impact the world around them. In addition, they cultivate life skills such as planning, brainstorming, collaboration, teamwork, and leadership as well as research and technical skills.
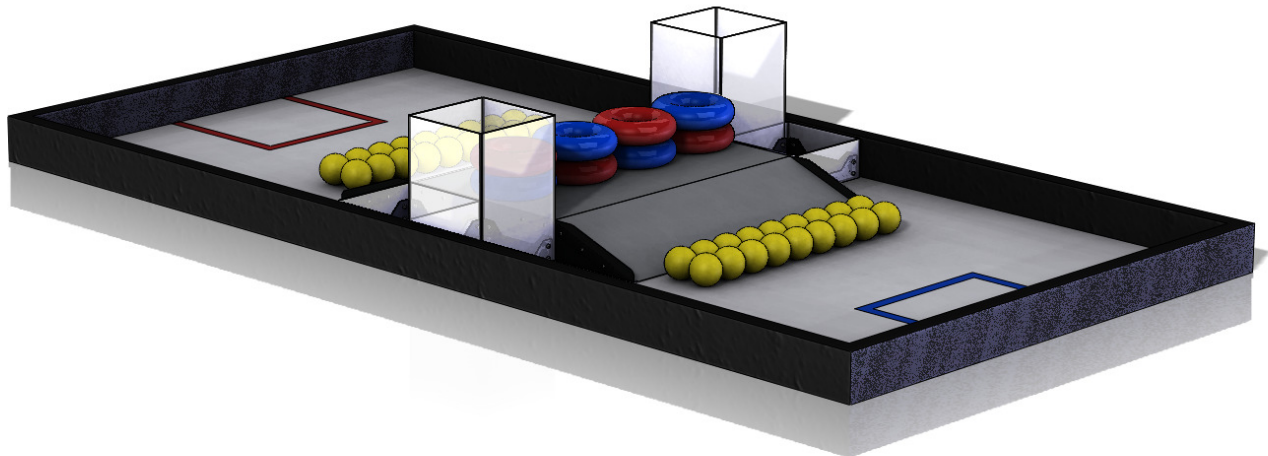
The Game

Game Description

Matches are played on a field set up as illustrated in the figures below. **Robot Skills Challenge** and the **Teamwork Tournament** use the exact same field and set up. In Robot Skills Challenge, one robot takes the field to score as many points as possible. In the Teamwork Tournament, an *Alliance* – one "red" robot and one "blue" robot compete in each *Match*. The object of the game is to attain the highest score by *Scoring Balls* in *Low Goals*, *High Goals*, and *Scoring Rings.* And by having your *Robot Parked* at the end of the match.
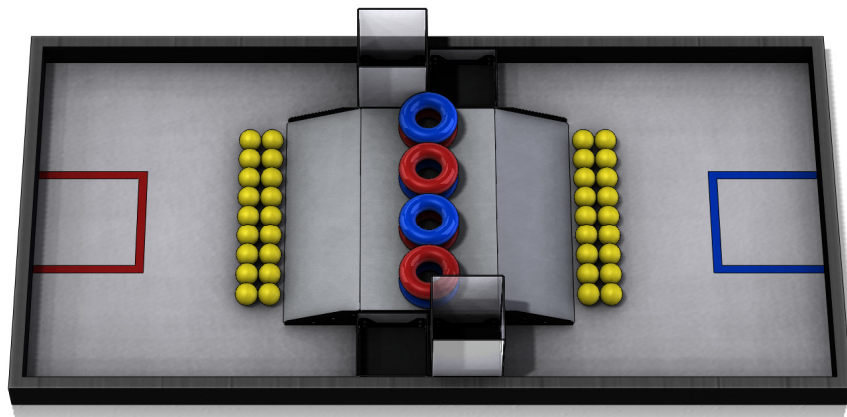
There are a total of thirty-six (36) *Balls* available as *Scoring Objects* in the game. There are two (2) *Low Goals*, two (2) *High Goals*, and eight (8) *Scoring Rings.*
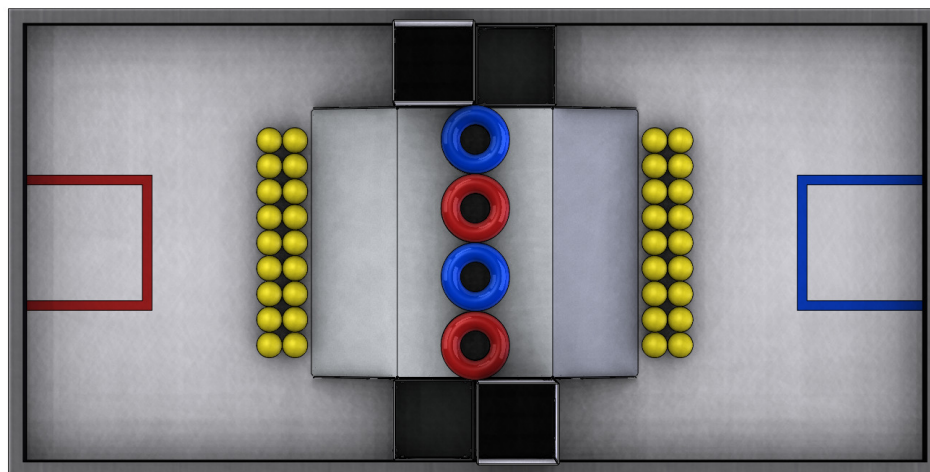
Game Definitions

Adult – Anyone not meeting the definition of *Student*.

Alliance – A pre-assigned grouping of two teams that work together for a given *Match*.

Alliance Score – Points scored in a Match awarded to both robots.

Disqualification – A penalty applied to a team for a behavioural violation. A team who is *Disqualified* in a *Qualifying Match* receives zero (0) points. At the head referee's discretion, repeated violations and *Disqualifications* for a single team may lead to its *Disqualification* for the entire tournament.

Driver – A *Student* team member responsible for operating and controlling the *Robot*.

Driver Station – The designated region where the *Drivers* must remain during their *Match*.

Field Element – The field perimeter, *Ramp*, *Low goals*, *High Goals, Scoring Rings* and all supporting structures.

Floor – The part of the playing field that is within the outer walls and is not part of the *Ramp*.

Goal – A *Low Goal* or a *High Goal*.

High Goal -- One of the two (2) 8" tall, rectangular shaped field structures into which teams place *Scoring Objects*.

Individual Score – Points scored in a Match awarded to either the red or blue robot, but not both.

Low Goal -- One of the two (2) 3 1/2" tall, rectangular shaped field structures into which teams place *Scoring Objects*.

Match – A *Match* consists of a *Driver Controlled Period* for a total time of 1:30 (ninety seconds).

Parked – A robot is considered to be *Parked* if it is on the Ramp and not touching the *Floor* at the end of the *Match*.

Ramp – The elevated structure in the middle of the field.

Robot – Anything which has passed inspection that a team places on the field prior to the start of a *Match*.

Scored – A *Scoring Object* is *Scored* in a *Goal* if it meets one of the following criteria.
　　1.　A *Scoring Object* is within the three-dimensional space defined by the outer edges of a *Low Goal* or *High Goal*, projected upwards and infinitely perpendicular to the playing field.
　　　　a.　For a *Scoring Object* to count under this clause, it must not be touching a *Robot*.
　　2.　A *Scoring Object* is inside a *Scoring Ring,* and touching the floor.

　　For a *Scoring Object* to count under either clause, it must remain in a *Scored* position, if/when all *Robots* were removed from the field. (By removed, we mean removing the robot and its contents from the field. Referees will be instructed to gently pull robots away from the *Goal* if necessary) i.e. The *Scoring Object* must not be supported by the *Robot*.

Scoring Object – A standard Tennis *Ball*

Starting Box – A defined square that is 12 inches wide and 12 inches long located along the center of each short wall.

Student – Anyone enrolled in a school or home-schooled up through and including Middle School.

Rings-n-Things Game Rules

Scoring

- A Ball *Scored* in a *Low Goal* is worth one (1) point for the A*lliance Score*.
- A Ball *Scored* in a *High Goal* is worth three (3) points for the A*lliance Score*.
- A Ball *Scored* in a *Scoring Ring* is worth two (2) points for the A*lliance Score and* one (1) point for the *Individual Score* of th*e robot* of the color of the *Scoring Ring*.
- A *Robot* that is *Parked* at the end of the Match is worth two (2) points for the *Alliance Score.*
- A Second *Robot Parked* at the end of the Match is worth three (3) points for the *Alliance Score*.

At the end of a Match, the Individual score is added to the Alliance score for each Robot's final score for the Match.

Safety Rules

- If at any time the *Robot* operation or team actions are deemed unsafe or have damaged the *Field Elements* or *Scoring Objects*, by the determination of the referees, the offending team may be *Disqualified*. The *Robot* will require re-inspection before it may again take the field.

- If a *Robot* goes completely out-of-bounds (outside the playing field), gets stuck, tips over, or otherwise is in need of human assistance, a five-second waiting period will be assessed after which the referee will place the robot upright on the field as near to the place on the field where it exited, or was stuck. The five-second waiting period starts when the driver of the robot puts the controller on the ground at his/her feet. The referee will count aloud to five, re-position the robot, and then signal an OK to the team. The controller cannot be picked up again until the referee signals an OK.

General Game Rules

<G1> When reading and applying the various rules in this document, please remember that common sense always applies in the VEX Pilot Program.

<G2> At the beginning of a *Match*, each *Robot* must:
   a. Only contact the *Floor* within the *Starting Box*
   b. Cannot extend more than 12 inches above the *Floor* until the *Match* begins.
   An offending *Robot* will be removed from the match at the Head Referee's discretion.

<G3> Each team shall include two *Drivers*.

<G4> During a *Match*, the *Drivers* must remain in their *Driver Station*.

<G5> *Robots* begin the *Match* on the *Floor*, not touching any *Game Objects* or *Field Elements.*

<G6> *Drivers* and *Coaches* are prohibited from making intentional contact with any *Scoring Object*, *Field Element* or *Robots* during a *Match.* Any intentional contact may result in a *Disqualification*. Accidental contact will not be penalized, unless the contact directly impacts the final outcome of the match. This type of accidental contact may result in a *Disqualification*.

<G7> During a *Match*, *Robots* may be operated only by the *Drivers*. The second *Driver* may not touch his/her team's controls until the controller is passed to him/her. Once the controller is passed, the first *Driver* may no longer touch his/her team's controls. Violations of this rule will result in a warning for minor offenses which do not affect the match. Egregious (match affecting) offenses will result in a *Disqualification*. Teams who receive multiple warnings may also receive a *Disqualification* at the head referee's discretion.

<G8> *Scoring Objects* that leave the playing field will be promptly returned to the playing field at the location nearest the point at which they exited.

    a. *Scoring Objects* will never be returned to the field in a *Scored* position.

<G9> Scores will be calculated for all *Matches* immediately after the *Match* once all objects on the field come to rest.

<G10> *Robots* may not intentionally detach parts during any *Match*, or leave mechanisms on the field. If an intentionally detached component or mechanism affects game play the team shall be *Disqualified* at the referee's discretion. Multiple intentional infractions may result in *Disqualification* for the entire competition.

<G11> *Robots* must be designed to permit easy removal of *Scoring Objects* from any grasping mechanism without requiring that the *Robot* have power after the *Match*.

<G12> Field tolerances may vary by as much as ±1", so teams must design their *Robots* accordingly.

<G13> Replays are at the discretion of the event organizer and head referee, and will only be issued in the most extreme circumstances.

<G14> All teams must adhere to all VEX Pilot Program Rules as they are written, and must abide by the listed intent of the rules.

<G15> All teams are expected to conduct themselves in a respectful and professional manner while competing in VEX Pilot Program events. If team members are disrespectful or uncivil to event staff, volunteers or fellow competitors, they may be *Disqualified* from their current or upcoming *Match*. It is important to remember that we are all judged based on how we deal with adversity. It is important that we all exhibit maturity and class when dealing with any difficult situations that may present themselves in both the VEX Pilot Program and life in general.

<G16> Prior to the start of each *Match*, each *Robot* will be placed in the *Starting Box* of the appropriate alliance color.

<G17> If a *Robot* goes completely out-of-bounds (outside the playing field), gets stuck, tips over, or otherwise is in need of human assistance, a five-second waiting period will be assessed after which the referee will place the robot upright on the field as near to the place on the field where it exited, or was stuck. The five-second waiting period starts when the driver of the robot puts the controller on the ground at his/her feet. The referee will count aloud to five, re-position the robot, and then signal an OK to the team. The controller cannot be picked up again until the referee signals an OK.

Robot Inspection

Description

Every *robot* will be required to pass a full inspection before being cleared to compete. This inspection will ensure that all *robot* rules and regulations are met. Initial inspections will typically take place during team registration/practice time. Every team should use the rules below as a guide to pre-inspect their *robot* and ensure that it meets all requirements.

Definitions

Robot – An operator controlled vehicle designed and built by a VEX Pilot Program team to perform specific tasks while competing. The robot can be constructed using only the VEX Beta Kit and additional components approved for the competition. No other parts will be allowed on the robot. Prior to participating in the competition, each *robot* will be required to pass an inspection.   Additional inspections may be required at the discretion of event personnel.

Inspection Rules

The team's *robot* must pass inspection before being allowed to compete in Qualification Rounds.
Noncompliance with any *robot* design or construction rule may result in disqualification of the robot at an event.
Each *robot* must display the appropriate identification features as mandated by the tournament.

At the start of each Match, the *robot* must satisfy the following constraints.
    a.   Only touching the floor within the *Starting Box*, i.e. a 12" x 12" square
    b.   No taller than 12"
Robots may hang outside of this box, provided they do not touch any other part of the field.

The starting configuration of the *robot* at the beginning of a match must be the same as a *robot* configuration inspected for compliance, and within the maximum allowed size.
    a.   Teams using more than one *robot* configuration at the beginning of matches must tell the inspector(s) and have the *robot* inspected in its largest configuration(s).
    b.   A team may NOT have their *robot* inspected in one configuration and then place it at the start of a match in an uninspected configuration.

When a team makes a modification to improve performance or reliability of their *robot*, the team may request a re-inspection of their robot by an Inspector.

Inspectors evaluate *robot*s to ensure that each *robot* has been designed to operate and function safely. The *robot* must be designed for safe operation and handling. Specific safety rules and limitations apply to the design and construction of a *robot*.

A *robot* is deemed successfully inspected when it has been recorded as "passed" by an Inspector.

The Event

Description

The VEX Pilot Program will be played in a **Robot Skills Challenge** (solo) format, along with a **Teamwork Tournament** (collaboration) format. Robot Skills Challenges are entirely Driver controlled. Each Robot Skills Challenge match consists of a single robot trying to score as many points as possible. Each Teamwork Tournament will include *Practice*, *Qualifying*, and *Final Matches*. After the *Qualifying Matches*, teams will be ranked based on their performance. The top teams will then participate in the *Final Matches* to determine the Teamwork Tournament champions.

Awards will be given to top teams in each format. Awards also given for overall performance along with judged criteria.

Definitions

Disqualification – A penalty applied to a team for a behavioral violation. When a team is disqualified in a *Match* they receive zero (0) points.

Finals Match – A match used to determine champions.

Practice Match – An un-scored match used to provide time for teams to get acquainted to the official playing field.

Robot Skills Match – A *Robot Skills Match* consists of a sixty (60) second *Driver Controlled Period*

Qualifying Match – A match used to determine the rankings.
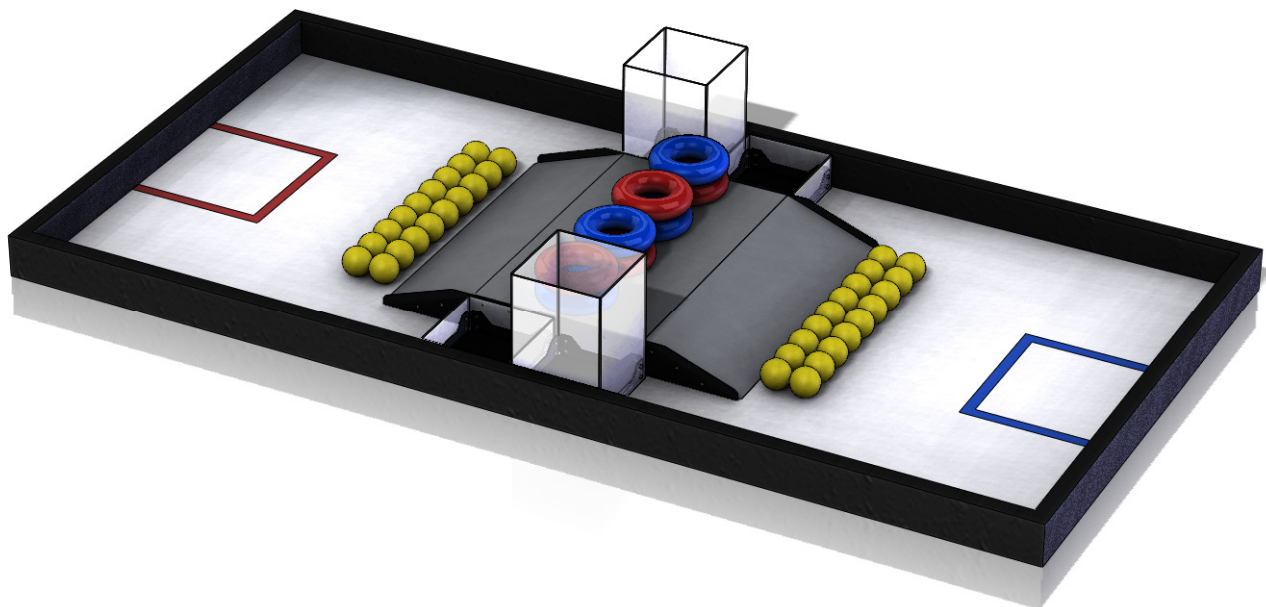
Robot Skills Challenge Rules

Please note that all rules from "The Game" section of the manual apply to Robot Skills, unless otherwise specified.

At the beginning of each *Robot Skills Match*, the robot may be placed in either of the two starting boxes on the field.

In a *Robot Skills Match,* all *Goals* are considered to be the same color for purposes of any rules or definitions

Robot Skills Challenge Scoring

All scoring is the same as in a regular *VEX Rings-n-Things* match.
- A Ball *Scored* in a *Low Goal* is worth one (1) point.
- A Ball *Scored* in a *High Goal* is worth three (3) points.
- A Ball *Scored* in a *Scoring Ring* is worth three (3) points.
- A *Robot* that is *Parked* at the end of the Match is worth two (2) points.

Robot Skills Challenge Format

- The Robot Skills Challenge field is identical to the teamwork tournament field.
- Teams will play *Robot Skills Matches* on a "first come, first serve" basis.
- Teams will be required to participate in a number of *Robot Skills Matches*, to be determined by the event organizers.
- If a team consists of more than one student, there will be two drivers for *Robot Skills Match*. *Drivers* must switch with between :35 and :25 remaining in the *Robot Skills Match*.

Robot Skills Challenge Rankings

- For each *Robot Skills Match* teams are awarded a score based on the above scoring rules.
- Teams will be ranked based on their total *Robot Skills Match* scores, with the team with the highest score being declared the Robot Skills Winner.
- In the case where two teams are tied for the highest score, the tie will be broken by removing each teams' lowest *Robot Skills Match* score and re-comparing totals. If still tied, the next lowest score will be removed, etc.
- If the tie still isn't broken, events may choose to allow teams to have one more deciding match or both teams will be declared the winner.

Teamwork Tournament Qualifying Matches ● ● ● ● ● ● ● ● ●

At the event *Practice Matches* may be played from the team registration time until the drivers meeting begins. Every effort will be made to equalize practice time for all teams, but they may be conducted on a first-come, first-served basis. These matches are not scored, and will not affect team ranking.

Schedule

- The *Qualifying Match* schedule will be available prior to opening ceremonies on the day of competition. This schedule will indicate alliance partners and match pairings. It will also indicate the robots color – red or blue. For tournaments with multiple fields, the schedule will also indicate which field the match will take place on.
- The *Qualifying Matches* will start immediately after opening ceremonies in accordance with the qualifying match schedule.
- Teams will be randomly assigned an alliance partner to compete in each *Qualifying Match*.
- All teams will be scored on the same number of *Qualifying Matches*.
- In some cases, a team will be asked to play in an additional *Qualifying Match*, but will not receive credit for playing this extra match.

Teamwork Tournament Rankings ● ● ● ● ● ● ● ● ●

- At the conclusion of each match, the score will be determined.
  - Each robot will receive the points scored for the Alliance (Alliance Points) plus points scored for Individual robots (Individual Points)
- For a *Qualifying Match*, if **no** member of a team is present in the driver station at the start of a match, that team is declared a "no show" and will receive zero (0) points. A "no show" is treated exactly the same as a *Disqualification*.
- Each team will have the same number of Qualifying Matches
- Points earned for each team in each Qualifying Match are added to get the teams total points
- Teams are ranked by total points.
- Ties in ranking are broken by:
  - Removing the lowest score from each teams total and comparing the new total score
  - If still tied, the next lowest score will be removed (on through all scores)
  - If still tied, the skills score will be used to determine placement.
  - If still tied, Events may declare a tie, or elect to have a skills challenge playoff to determine placement.

Teamwork Tournament Final Matches ● ● ● ● ● ● ● ● ●

- At the conclusion of *Qualification Matches*, the top teams will advance to the *Final Matches*.
- There will be ten (10) teams in the *Final Matches*.
- The first and second ranked teams form an alliance, third and fourth ranked teams form another alliance (and so on) for the Final Matches.
- Starting with the lowest ranked alliance, each alliance participates in ONE Finals Match. After all the Finals matches are run, the highest score of those matches is the winner. Second highest score finishes in second place, and so on. (If there is a tie, the higher ranked alliance prior to the Final Matches shall be declared to finish higher)
- Scoring for the *Finals Matches* has no Individual Scores. For the purpose of the *Finals Matches*, all *Goals* are considered to be the same color for purposes of any rules or definitions. All points are shared.

Teamwork Tournament Rules

Referees have ultimate authority during the competition. **Their rulings are final.**
a. The referees will not review any recorded replays.
b. Any questions for the referees must be brought forward by a student drive team member within the time period of two (2) matches or immediately after the score is announced of an elimination match.

The only people from a team permitted by the playing field are the two drive team members who are identified by the drive team badges. These badges are interchangeable but not during a match.

During matches, two teams from an alliance that will play on the field.

There are no time outs in the qualifying matches; in the finals matches, each alliance will be allotted ONE time out of no more than three minutes, as permitted by the head referee. The matches must progress according to schedule.
a. If a robot cannot report for a match, at least one member of the team should report to the field for the match.

All Drivers **must** wear safety glasses or glasses with side shields while in the driver station during matches. While in the pit area it is highly recommended that all team members wear safety glasses.

Awards

Awards Descriptions

This section details the full list of awards presented in the VEX Pilot Program at the VEX Pilot Program World Championship.

The awards which will be offered at the VEX Robotics World Championship tournaments are:

- Excellence Award Middle School team
- Excellence Award Elementary School team
- Design Award Middle School team
- Design Award Elementary School team
- Teamwork Champion Award (one trophy for each team on the winning alliance)
- 2nd Place Teamwork Award (one trophy for each team on the 2nd Place alliance)
- 3rd Place Teamwork Award (one trophy for each team on the 3rd Place alliance)
- Robot Skills Challenge Award
- 2nd Place Robot Skills Challenge Award
- 3rd Place Robot Skills Challenge Award
- STEM Award
- Spirit Award
- Sportsmanship Award
- Judges Award
- Build Award
- Create Award
- Think Award
- Amaze Award
- Innovation Award

Descriptions for all of the different awards presented at the VEX Robotics Championship are shown on the subsequent pages.

Performance Awards

Excellence Award: Top All Around Team (Robot Performance & Judged)

The **Excellence Award** is the highest award presented in the VEX Pilot Program. The recipient of this award is a team that exemplifies overall excellence in creating a well-rounded VEX robotics program. This team excels in many areas and is a shining example of dedication, devotion, hard work and teamwork. As a strong contender in numerous award categories, this team deserves to be recognized for building a quality robot and a "team" committed to quality in everything that they do.

Teams are given points towards the Excellence Award in the following categories:

- Teamwork Qualification Round Ranking
- Robot Skills Ranking
- Judged performance in all other award categories

Using this wide range of criteria, the Excellence Award will be presented to the team who excels in all areas of VEX Robotics.

Teamwork Champions: Each Team on 1st Place Teamwork Alliance

Teamwork 2nd Place: Each Team on 2nd Place Teamwork Alliance

Teamwork 3rd Place: Each Team on 3rd Place Teamwork Alliance

Robot Skills Challenge Champion: Top Robot Skills Team

Robot Skills Challenge 2nd Place: Runner-Up Robot Skills Team

Robot Skills Challenge 3rd Place: 3rd Place Robot Skills Team

Team Awards

Amaze Award: Team with an amazing, well rounded and top performing robot

The **Amaze Award** is presented to a team that has built a competition robot that clearly demonstrates overall quality. A solid mechanical design along with demonstrated robot programming, robustness, strong performance and consistency are key attributes assessed for this award.

Key Criteria:

1. Robot design is consistently high-scoring and competitive
2. Robot is robustly constructed to fulfill its designed task

VEX Pilot Program – Rings-n-Things

Build Award: Team with a well-crafted robot

The **Build Award** is given to a team that has built a well crafted and constructed robot that also shows a clear dedication to safety and attention to detail. Judges will be looking for robots that have a professional feel and quality look to them, with clear attention to detail in construction, efficient use of mechanical and electronic components, and reliability on the competition field.

Key Criteria:

1. Robot construction is of professional quality; robust, clean and elegant use of materials
2. Robot efficiently uses mechanical and electrical components
3. Robot is designed with detailed attention to the hazards and rigors of the competition
4. Teamwork and interview quality

Create Award: Robot with a creative engineering solution

The **Create Award** is given to the team whose robot design incorporates a creative engineering solution to the design challenges of this year's game. Judges will be looking for teams that are able to demonstrate a highly creative engineering process that incorporates solid mechanical ability, unique design solutions, and innovative approaches to the game play.

Key Criteria:

1. Robot is a well-crafted, unique design solution, demonstrating creative thinking
2. Team has demonstrated a highly creative design process and methodology
3. Team has committed to ambitious and creative approaches to playing the game

Think Award: Awarded to the team with the best scoring strategy during the Robot Skills Challenge.

The **THINK Award** is goes to a team the judges decide had the best scoring strategy during the Robot Skills Challenge.

Design Award: Team with a professional design approach

The **Design Award** is presented to a team that demonstrates an organized and professional approach to the design process, project and time management and team organization. The winning team will be able to describe how they implemented an efficient and productive design process to accomplish the project goals.

One of the primary missions of the VEX Pilot Program is to help students acquire real world life skills that will benefit them in their academic and professional future. The Engineering Notebook is a way for teams to document how the VEX Pilot Program experience has helped them to better understand the engineering design process while also practicing a variety of critical life skills including project management, time management, brainstorming and teamwork. The Engineering Notebook requirement of the Design Award has no specified format; each notebook should be created through a concerted effort by a team to document their design decisions.

The Engineering Notebook is an opportunity to document everything a team does so that it can serve as a historical guide of lessons learned and best practices. Students may include a plethora of things in their Engineering Notebook including: team meeting notes, design concepts and sketches, pictures, notes from competitions, biographies of team members (students, teachers and mentors), team members' observations and thoughts, team organization practices, and any other documentation that a team finds useful.

VEX Pilot Program – Rings-n-Things

Key Criteria:

1. Engineering Notebook is a clear, complete document of the team's design process
2. Team is able to explain their design and strategy throughout the season
3. Team demonstrates personnel, time and resource management through the season

Innovate Award: Team that has the most "Innovative" single design feature on their robot

The **Innovate Award** is presented to a team that has demonstrated a strong combination of ingenuity and innovation in designing their VEX robot. This award will typically recognize a specific, unique piece of engineering that exemplifies thinking outside of the box and innovative engineering design.

Key Criteria:

1. Robot design demonstrates an ingenious and innovative piece of engineering
2. Innovative feature is soundly crafted and is an effective solution to a design problem
3. Innovative solution is integrated as a part of an overall well crafted robot

Teamwork and interview quality

Judges' Award: Judges' recognition

The **Judges' Award** goes to a team the judges decide is deserving of special recognition. Judges consider a number of possible criteria for this award, such as team displays of special attributes, exemplary effort and perseverance at the event, and team accomplishments or endeavors throughout the season that may not fall under existing awards - but are nonetheless deserving of special recognition.

Spirit Award: Team that shows the most energy and positive outward actions.

The **Spirit Award** is presented to the team that demonstrates the most team spirit. They are always positive no matter the results of on-field play. They show team spirit in the pits, on the field, in the audience, and in interviews.

Sportsmanship Award: Team that is extremely courteous and most enthusiastic

The **Sportsmanship Award** is presented to a team that has earned the respect and admiration of the volunteers and other teams at the event. This team is a model for all to follow because team members interact with everyone in a positive, respectful manner in the spirit of friendly competition and cooperation. Additionally, demonstrating excitement and enthusiasm throughout the event is a clear sign that a team is demonstrating sportsmanship. This award is judged during the event by teams, referees and volunteers.

Key Criteria:

1. Team is courteous, helpful and respectful to everyone at the event, on and off the field
2. Team treats others on the playing field in the spirit of friendly competition
3. Team demonstrates respect and willingness to help to event staff and spectators

Team demonstrates excitement and enthusiasm throughout the event

STEM AWARD: Team that has the best STEM presentation

The **STEM Award** is presented to the team that the judges have chosen as a result of the presentation of the team's STEM project. Details on this project can be found in the Document titled "STEM Project".

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